



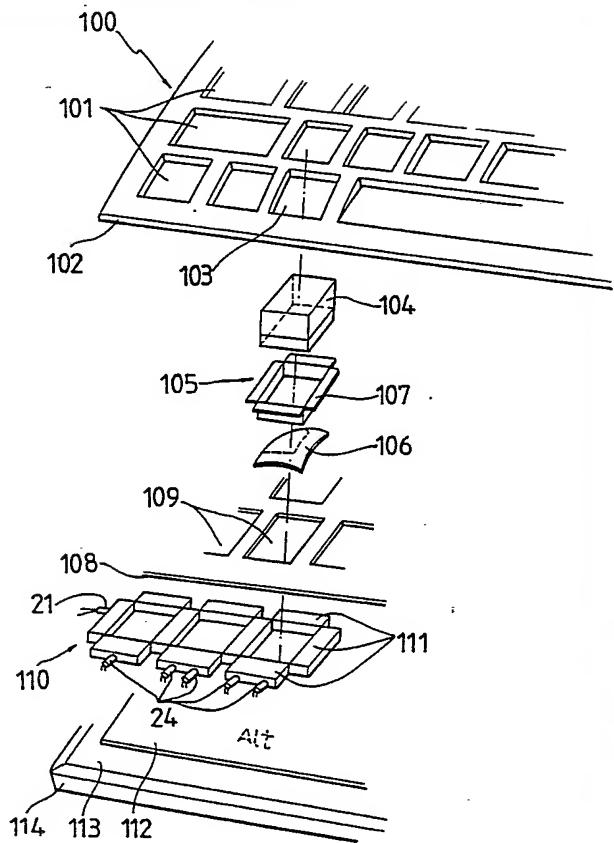
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(71)(72) Applicant and Inventor: TAK, Seung, Ho [KR/KR]; Hyundai Apt 16, Dong 204 Ho, 230, Kongneug-2dong, Nowon-ku, Seoul 139-242 (KR).			Published <i>With international search report.</i>
(74) Agent: SUH, Sang, Wook; 823-23, Youksam-dong, Kangnam, Seoul 135-080 (KR).			

## (54) Title: A MULTIPURPOSE OPTICAL INTELLIGENT KEY BOARD APPARATUS

## (57) Abstract

A multipurpose optical intelligent key board apparatus (100) permits a plurality of key tops (104) made of transparent materials in an optical dot matrix arrangement to be moved upward and downward. It forces the corresponding positions of the optical dot matrix to be turned on or off, so that a computer or an electronic appliance can be operated by the predetermined key inputs. Therefore, the function command words and characters appearing on the key tops is displayed by a display device (112) supported by its software.



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## DESCRIPTION

## A MULTIPURPOSE OPTICAL INTELLIGENT KEY BOARD APPARATUS

## 5 TECHNICAL FIELD

The present invention relates to a key board adapted for use in appliances such as a computer or related terminals, etc., and more particularly, to a multipurpose optical intelligent key board apparatus affording the variety of key 10 inputs.

## BACKGROUND ART

A general key board is called an input device adapted to electronic appliances, which is arranged to have a 15 predetermined number of keys associated with a corresponding function. In other words, a key board used in appliances such as a computer or related terminals is supposed to have keys for using English characters together with a mother native tongue in many countries, in a manner that each of the key 20 tops lets two characters different of each other be printed in a predetermined arrangement to be harmonized with corresponding literary syntax systems or be doubly moulded in a similar pattern. Furthermore, because literary syntax systems in each of the European Alphabetic countries have a 25 greater range of characters and vowel possibilities to be used, which are different from the English language, their key boards in a corresponding country force the positions of key

tops to be changed and must be produced in a new key board pattern. Typical characters are kinds of German, French, English and etc.

Especially, in the 1980s various benefits of software 5 standardized by using a personal computer compatible with an IBM-PC on the basis of a software "MS-DOS" have been developed. To keep up with this progress, a key board is provided with ten or twelve keys having different usage purposes from one another, called function keys, which are 10 arranged according to the software to be used. These function keys and keys "ALT, CTRL, SHIFT and others" are supported by various command words associated with their combination according to the programming of software, but it is inevitable 15 to issue different command words corresponding to the programming of each software because of the characteristics of the software. Nevertheless, the standardization work followed by the usage of these keys has been impossible until now. Most computer users have to study the computer's operating manual and ask for some help to the computer itself by pressing the 20 function key F1 or a key HELP. Also, it takes a long time for the user to get used to the corresponding program, and the use of a new software requires learning its procedures. Most programming corresponding to the software to be used are utilized on the basis of only several command words being well 25 aware of by the user, and the usage efficiency of a software is reduced.

A part of applied software use dividing the particular

portion of a screen, or to support the user facility based on a window conception, but its use occupies the memory area necessary therefor independent of the predetermined memory region for starting the main program to be used, it limits the 5 operational capacity of a computer thereby to deteriorate the operation efficiency.

The software such as an AUTOCAD is configured to use two screens, one of which becomes only a command word exclusive space and the other of which wholly forms a working space. 10 This multi-screen system causes inconveniences, non-economic and inefficiency to the user. Touching screens or Liquid Crystal Touching screen are developed as the alternatives for resolving these problems, but these methods have disadvantages in respect of the user's degree of acquaintance and the 15 operational error by a careless mistake.

Considering these points, the main object of the present invention is to provide a multipurpose optical intelligent key board apparatus for performing the optical supporting operation with respect to all programming of software.

20 Another object of the present invention is to provide a multipurpose optical intelligent key board apparatus for supporting any language in addition to a mother native tongue in a country to be used with respect to all keys on a key board.

25 Also, another object of the present invention is to provide a multipurpose optical intelligent key board apparatus for enabling all keys on the key board to represent the

command words of a software in itself, thereby functioning as a command word interface.

Still another object of the present invention is to provide a multipurpose optical intelligent key board apparatus 5 for supporting the software of a key board itself, in which the arrangement of the key board is changeable to permit all key tops to show command words of a computer corresponding to the programming of a software to be used.

10 Still another object of the present invention is to provide a multipurpose optical intelligent key board apparatus for being capable of operating all keys on the key board as function keys and corresponding command word keys for the control of an electronic appliance.

15

#### DISCLOSURE OF THE INVENTION

The present invention comprises: a key board means receiving all key top means in the predetermined arrangement, respectively; a plurality of the key top means made of 20 transparent materials, such as Epoxy resin, Acryl resin, glass or crystal in the form of a rectangle and for being switched to represent auxiliary command words and characters; a plurality of light interrupting means for retaining the key tops, respectively, to block an optical beam or a laser; means 25 for elastically supporting all paired key top means and light interrupt means, respectively; a middle plate means made of metal for having a configuration the same as that of the key

board means as well as for supporting all elastic means and light interrupting means; an optical means for sensing the operation of the key top means during the downward moving of the light interrupting means out of the lower portion of the 5 middle plate to block the optical beam or laser; a display means of LCD or LED and an optical device in a dot matrix arrangement for being capable of freely changing a character pattern the same as the configuration of the key board means having a plurality of key top means according to the 10 application of a software to be used; and a illuminating means including a luminescence emitting plate for being operated by means of a minimum current at the bottom portion of the display means.

Thus, the present invention enables a controllable 15 display means capable of attempting the changing of a software to represent the function key on a corresponding key top to have an auxiliary character arrangement as well as to operate the corresponding electronic appliance by forcing the light sensing device to interrupt the function of the corresponding 20 key top when being pressed.

This optical key board apparatus is able to represent all characters used in the whole world by providing a key board utility software without printing at least one character on all key tops according to countries.

25 The optical intelligent key board also can display the play-role of function keys used in all applied software on a LCD or LED and an optical device below the bottom portion of

each of the key tops. This display state is visually recognized through each of key tops made of transparent materials, thereby realizing a key board for strengthening the user's convenience. As a result, the users reduce their 5 inconveniences consulting with a manual corresponding to each of the applied software, and the functions of applied software are used at maximum to overcome the disadvantage by the user's partially knowledge.

The present invention furthermore can provide a 10 multipurpose intelligent key board apparatus compatible with any programming of a software. The multipurpose intelligent key board apparatus can be adapted to a note-book PC and Laptop computer, so that it may be used like an exclusive use terminal of a word-processor, a data base computer and a 15 spread sheet. It can not only be adapted to the key board of a POS terminal and a portable telephone, but also realize the various function additions as well as the reduction of the number of key switches on the key board.

## 20 BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be explained in detail with respect to the attached drawings, in which:

Fig. 1 is a plan view showing the arrangement of a conventional key board corresponding to an AT type computer;

25 Fig. 2 is a view illustrating the arrangement of optical couplers adapted to the principal of the present invention;

Fig. 3 is a view illustrating the adaption of the

switching functions of the key tops to a dot matrix according to the principal of the present invention;

Fig. 4 is a schematic view illustrating the display state of the function key tops according to the principal of the 5 present invention;

Fig. 5 is an exploded perspective view illustrating important components if the present invention is adapted to a key board of an AT type;

Figs. 6A and 6B are cross-sectional views illustrating 10 the assembly of the present invention, in which Fig. 6A illustrates the state of key tops when fitted into a light interrupting device;

Fig. 7 and Fig. 8 are plan views illustrating the arrangement of a key board adapted to the English/Korean 15 language's word-processor according to the present invention; and,

Fig. 9 and Fig. 10 are exploded perspective views illustrating the control key board of an electronic appliance according to the present invention.

20

#### BEST MODE FOR CARRYING OUT THE PREFERRED EMBODIMENTS

Fig. 1 shows parts of a conventional key board of an AT type adapted to an IBM PC, which has the arrangement of Korean characters with inherent English characters. The key board is 25 provided with a plurality of key top groups 10, 12, 14, 16, 18... arranged in line, on each of the key tops of which corresponding characters are printed. For example, the key top

group 10 in the first line is arranged so that its key tops respectively represent figures 1, 2... and the predetermined enlarging characters !, @... when being used with a key SHIFT. The key top group 12 has key tops in the same line which 5 represent capital letters Q, W, E... in English and Korean characters ₩, ₩, ₩... with the key SHIFT and English characters q, w, ... and Korean characters ₩, z, c ..., independently. A key ALT of the key top group 18 performs the special function with the combination or one of the other key 10 tops.

These key top switches on the conventional key board let their upper plan portion be printed by the predetermined corresponding characters or are doubly moulded to have the predetermined corresponding characters. The configuration of 15 the key top switches has been variously developed to be adapted to the mechanical contact type, the electrostatic capacity change type and the membrane type, etc., but the key board must be repaired while being totally disassembled, even though only one of the key top switches, for example 83 or 20 103, might have been out of order.

In light of these points, the present invention includes a plurality of key top switches in a transparent rectangular or another predetermined shape using materials, such as glass, acryl, plastic and crystal. These materials transmit the light 25 by the optical refraction to visually observe characters, graphs and figures represented at a display device of LCD type and so on, which is positioned below its bottom surface,

thereby having effects the same as those of the printed key board. Thus, an optical transmitting key board is constructed to force its key tops of transparent materials to visually obtain characters, graphs and figures represented at a display 5 device in the original state or in a scale down or up by means of the optical refraction method.

First, the key tops are respectively coated or adhered on their vertical lower side surfaces by opaque materials, so that they are positioned on the horizontal plane X and Y 10 coordinates like a matrix arrangement of more than 6\*32 consisting of infrared ray receiving and emitting elements, thereby detecting the light blocking positions. The transparent key tops also are coated on their vertical surface by opaque materials, so that an optical wave guider of 15 transparent materials is positioned therebetween to guide infrared rays, thereby detecting the displacement of the key stroke to get a sensing device to read the scan code on the X and Y coordinates.

According to the principal of the present invention, the 20 key top switches are arranged as shown in Fig. 2, in which the vertical columns and horizontal rows form a matrix. A computer key board is similarly arranged in 6 columns \* 32 rows of a minimum unit. The key matrix 20 has a light emitting diode group 21 positioned in the right columns of the drawing and a 25 photo-transistor group 22 consisting of light receiving elements located in the left columns on the same line of the light emitting diodes. Also, a photo-transistor group 23 is

arranged in the upper rows and a light emitting diode group 24 in the lower rows corresponding to the light receiving light elements. This arrangement forms a switching matrix of columns V1 to V6 and rows H1 to H5 as shown in Fig. 3. It is based on 5 the concept of Fig. 4.

Assumed that function key tops F1 to F12 associated with a key board of an AT type is adapted to the software of a predetermined word-processor, the key top F1 or 31 is a key top HELP, the key top F2 or 32 is a key top ASSIST, the key 10 top F3 or 33 is a key top APPEND, and the key top F4 or 34 is a key top EDIT, which are made of transparent materials to represent a predetermined corresponding function. Below the bottom surface of these key tops are a light emitting element group 21 and a photo-transistor group 23 receiving infrared 15 rays are mounted in a matrix arrangement. The optical coupler groups 21 and 22 are provided with function key tops 31 to 35 functioning as an optical switch, on each of which opaque material or light interrupting devices 41 to 45 is mounted in the same line with the photo-coupler groups. A display device 20 112 of a LCD type is mounted below the bottom surface of these light interrupting device 41 to 45 to enable the function key tops 31 to 35 to represent the corresponding information as described in detail below.

A typical example of the present invention adapted to a 25 computer key board is illustrated in Figs. 5, 6, 7 and 8, and A typical example of the present invention adapted to a telephone key board or calculator key board of an electronic

appliance is illustrated in Figs. 9, 10 and 11.

Referring to Fig. 5, a multipurpose optical intelligent key board apparatus 100 comprises a key board front plate 102 having a plurality of holes 101 in the form of receiving 5 corresponding key tops, respectively, which are arranged in a predetermined matrix. The key tops 104 are made of transparent materials, such as Acryl resin, plastic, glass or crystal, in the form of a rectangular shape as shown in the drawing or another geometrical shape. The key top 104 is fitted into an 10 optical interrupting device 105 constructed to wrap around its periphery at the predetermined height, in which the optical interrupting device 105 is made of metal or other materials considered as a interrupting member to interrupt light.

The optical interrupting device 105 is provided with a 15 flange 107 horizontally extended at the predetermined height from each surface of the key top 105, in which the predetermined height is set to allow the flange 107 to be elastically supported on the lower surface of the key board front plate 102 and to be contacted with a middle plate 108 20 during the key top 104 being pressed.

A leaf spring or coil spring 106 is supported on the middle plate 108 having relatively small holes 109 formed in the same arrangement as that of holes 101 and 103... on the key board front plate 104 in order to elastically retain the 25 key tops 104 with the optical interrupting device 105. A plurality of optical guiders 110 are mounted adjacent to the bottom surface of the middle plate 108, which has a plurality

of optical couplers around the periphery of the key board 102. The optical guider 110 is configured to have the arrangement the same as that of the holes 101 of the key board 102, in a manner that the photo-coupler groups including the light emitting diode and photo-transistor are disposed on the front and rear portions and the left and right portions of the key board 2. The drawing illustrates three light emitting diodes of the lower light emitting diode group 24 and one light emitting diode of the left light emitting diode group 21. In addition, the optical guiders 110 are configured to receive all optical interrupting devices 105 related with a plurality of key tops 104, respectively. A flat display device 112 of LCD type is located below the bottom surface of the optical guider 110 so that it can be divided to confirm with the arrangement of the holes 101 on the key board 102 to display the character or function of the key tops 104.

The liquid crystal display device 112 may be a dot matrix liquid crystal plate to display information of the function key tops and the character key top according to the programming of a software. The liquid crystal display device 112 may have a luminescence plate 113 on its lower portion to meet the user's desire with respect to the background color.

All these components may be assembled into a base plate 114, and then the base plate 114 is coupled with the key board 102 to complete the assembly of the multipurpose optical intelligent key board apparatus 100.

Concretely, as shown in Figs. 6A and 6B, a key top 104 is

projected upward through a key board 102 while being supported by a leaf spring 106 between a middle plate 108 and a flange 107. An optical guider 110 is fixed to the lower surface of the middle plate 108. A display device 112, a luminescence plate 113 and a base plate 114 in turn are arranged downward spaced from the bottom surface of the optical guider 110.

5 The multipurpose optical intelligent key board apparatus 100 can display information of the function/character key tops according to the programming of a software to be used as 10 illustrated in Figs. 7 and 8. Referring to Fig. 7, the functions of key tops 31, 32, 33, 34... illustrate its corresponding function in the Korean language, the figure key top group 10 represents only figures, the character key top groups 12 and 14 show the key functions corresponding to 15 Korean characters and the key tops SHIFT and ALT of the other character key top groups 16 and 18 permit its corresponding functions to be visually observed. This Korean display key tops may be represented in English as shown in Fig. 8. The explanation with respect to Fig. 8 is omitted because of being 20 the same as the explanation of Fig. 7.

Figs. 9 and 10 illustrate examples adapted to an electronic appliance, in which Fig. 9 is an exploded view of a calculator, and Fig. 10 is an exploded perspective view of a key board adapted to an electronic appliance.

25 The important components shown in Figs. 9 and 10 are the same as those of Fig. 5, for which the same components are referenced as the same numbers, and their detailed explanation

is omitted. The different things between Fig. 5 and Fig. 9 are what a photo-transistor group 22 including a plurality of light receiving elements is arranged against a light emitting diode group 21 including a plurality of light emitting elements, and a liquid crystal display device 112 displays characters associated with information of corresponding key tops. The configuration of Fig. 10 is equal to that of Fig. 9, except that a leaf spring for elastically supporting key tops 104 is substituted by an elastic spring 106.

10

#### INDUSTRIAL APPLICABILITY

As described above, the present invention strengthens the support of a software with respect to a liquid crystal display device for displaying not only the command words of the 15 software but also the characters to be used, in which the key board connected to a computer is associated with information of the function keys and character keys. Thus, the present invention can teach the operating of the programming associated with a computer or an electronic appliance to the 20 users through a plurality of optical representing key tops.

## CLAIMS

1. A multipurpose optical intelligent key board apparatus provided with a plurality of key tops comprising:
  - 5 a key board means receiving all key top means in the predetermined arrangement, respectively;
  - a plurality of the key top means being configured to be in the form of a rectangular and for being switched to represent auxiliary command words and characters;
  - 10 a plurality of light interrupting means for retaining the key tops, respectively, to block an optical beam or a laser;
  - means for elastically supporting all paired key top means and light interrupt means, respectively;
  - 15 a middle plate means made of metal for having a configuration the same as that of the key board means as well as for supporting all elastic means and light interrupting means;
  - an optical means for sensing the operation of the key top means during the downward moving of the light interrupting means out of the lower portion of the middle plate to block the optical beam or laser;
  - 20 a display means of LCD or LED and an optical device in a dot matrix arrangement for being capable of freely changing a character pattern the same as the configuration of the key board means having a plurality of key top means according to the application of a software to be used; and,
  - 25 an illuminating means including a luminescence emitting plate for being operated by means of a minimum current at the

bottom portion of the display means.

2. The multipurpose optical intelligent key board apparatus as claimed in Claim 1, in which the key top means is made of 5 transparent materials such as Epoxy resin, Acryl resin, glass or crystal, etc.

3. The multipurpose optical intelligent key board apparatus as claimed in Claim 1, in which the light interrupting means is 10 made of metal or opaque materials.

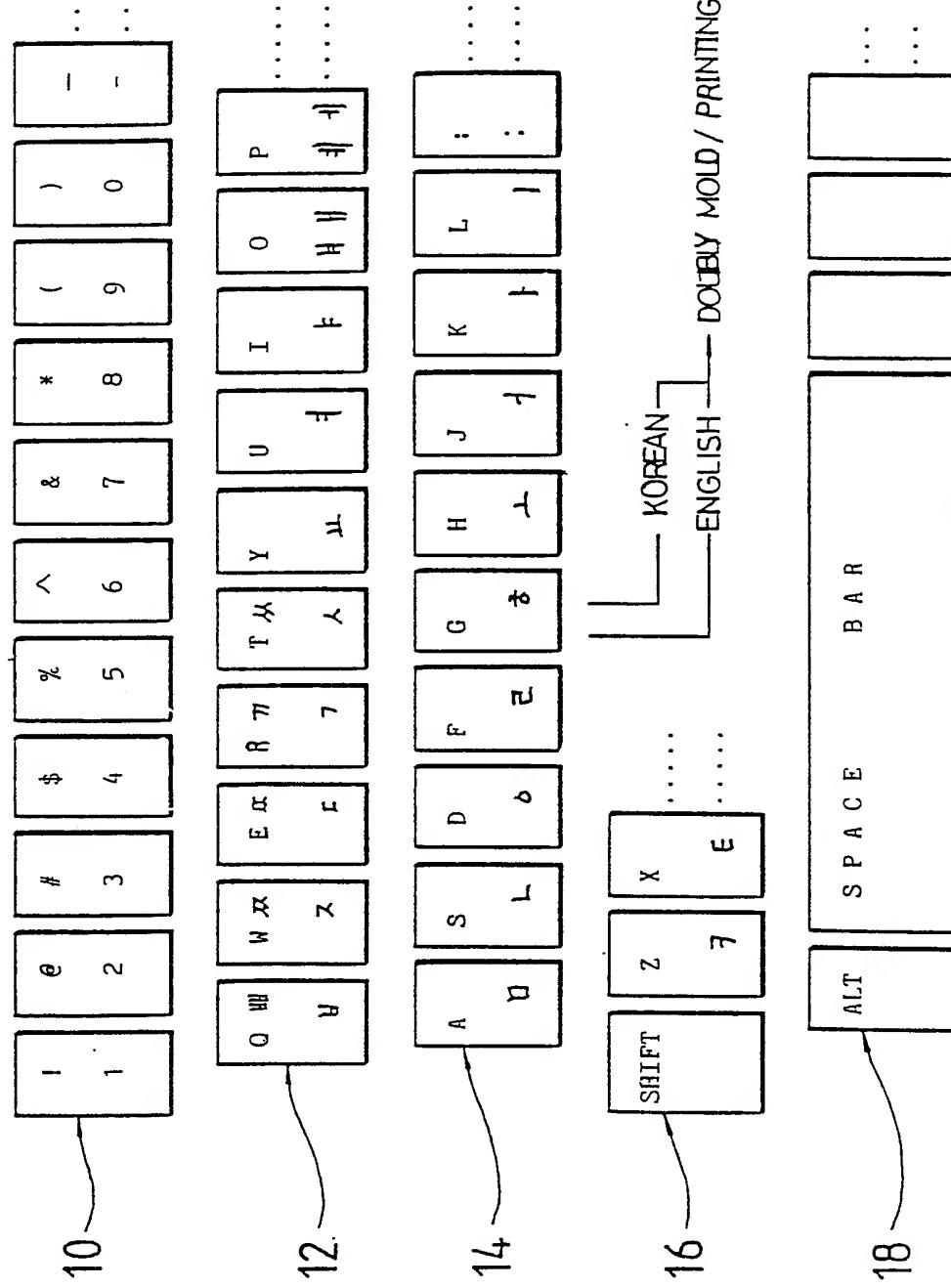
4. The multipurpose optical intelligent key board apparatus as claimed in Claim 1, in which the elastic supporting means is a leaf spring or a spring.

15

5. The multipurpose optical intelligent key board apparatus as claimed in Claim 1, in which the display means is a LCD device or an optical intelligent key board arranged in a plurality of light emitting groups, which is supported by its software.

20

## FIG. 1



2 G. I. F.

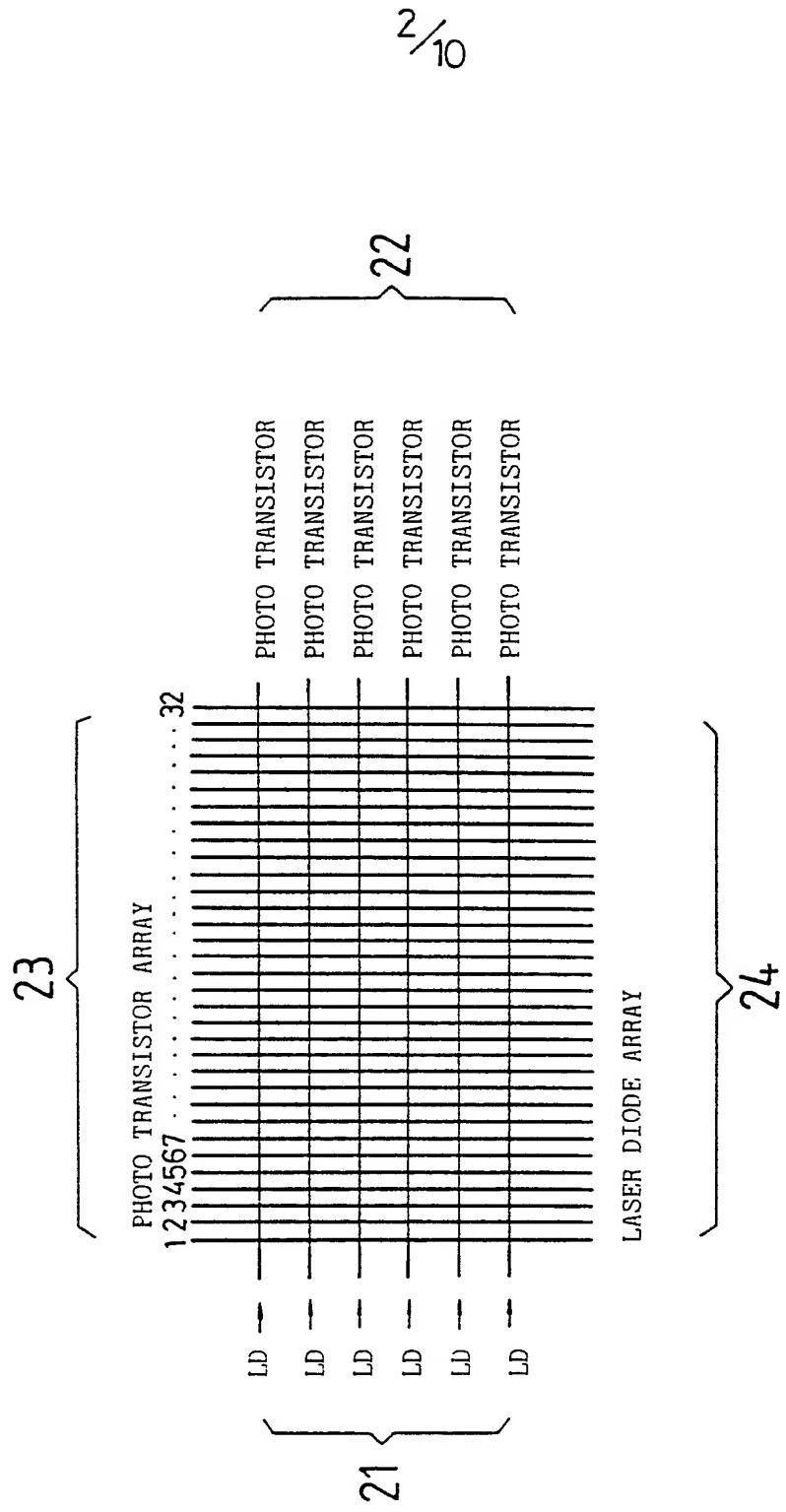
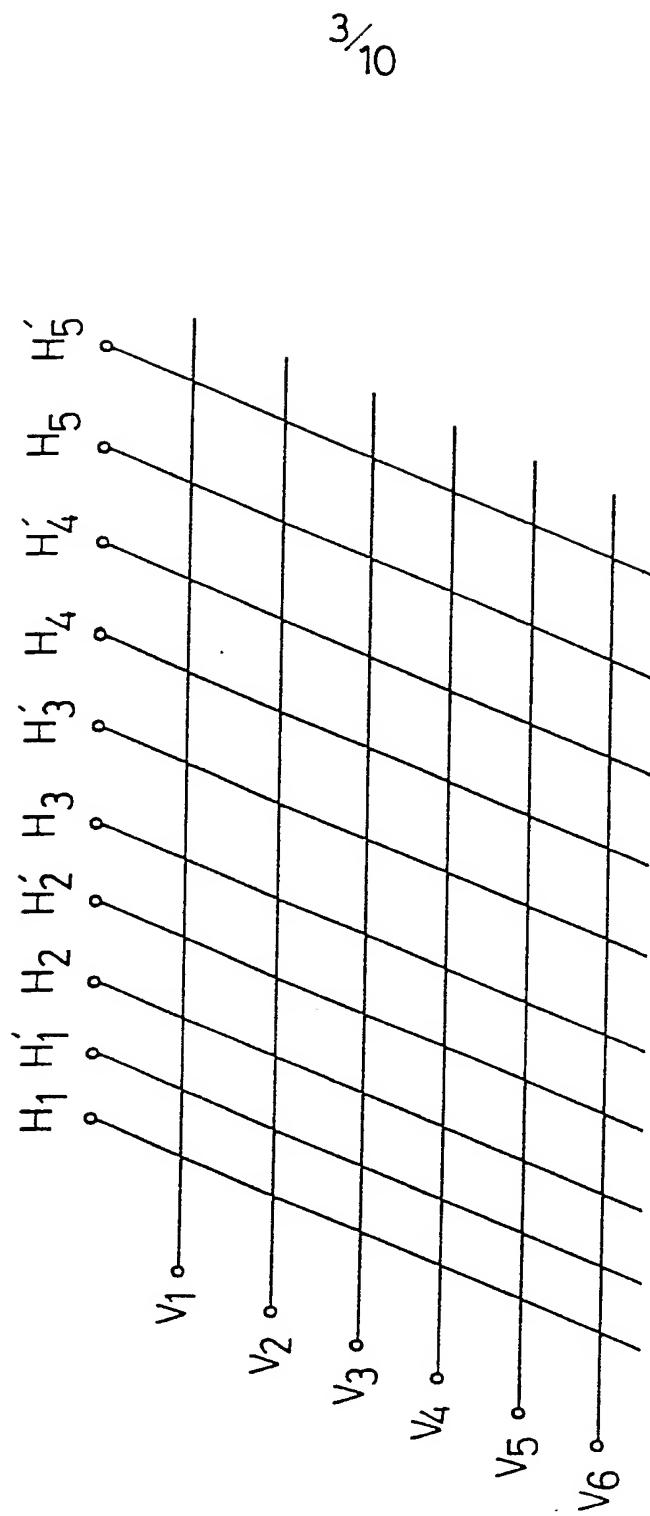
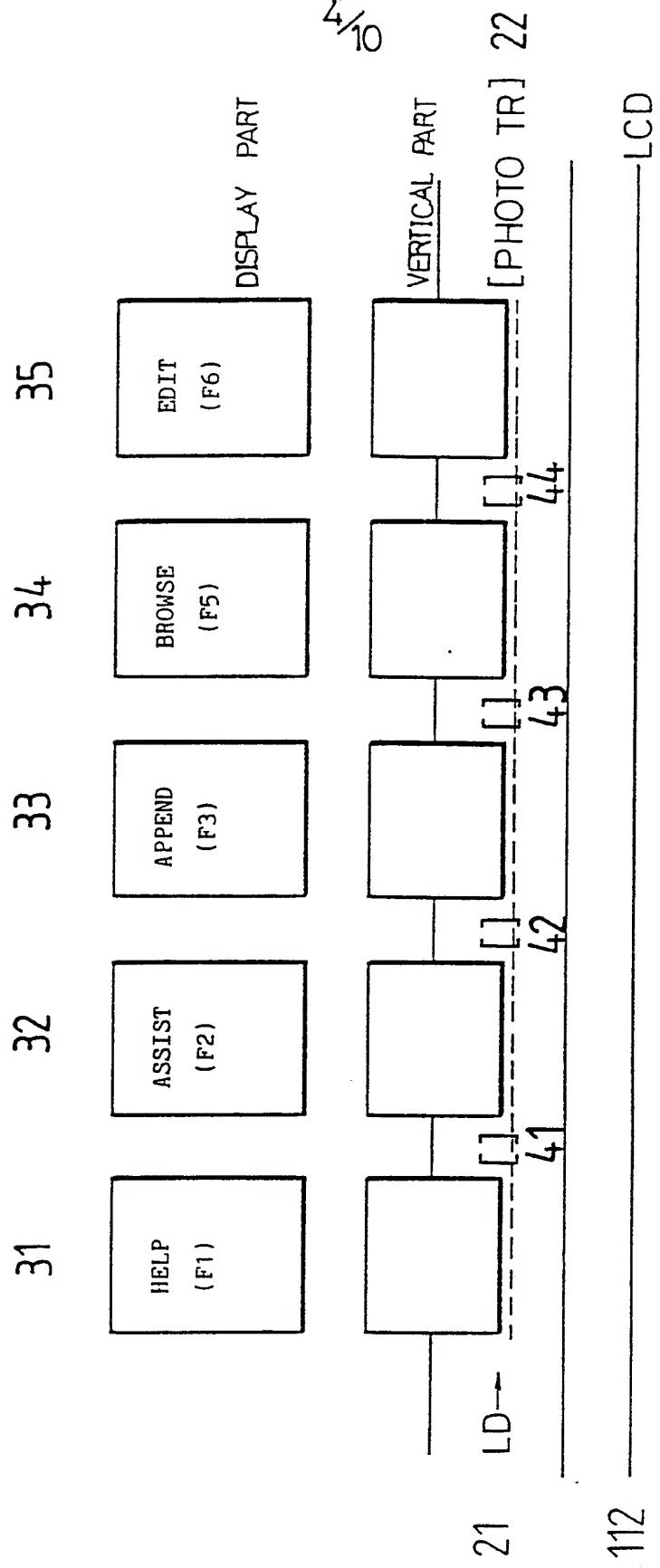
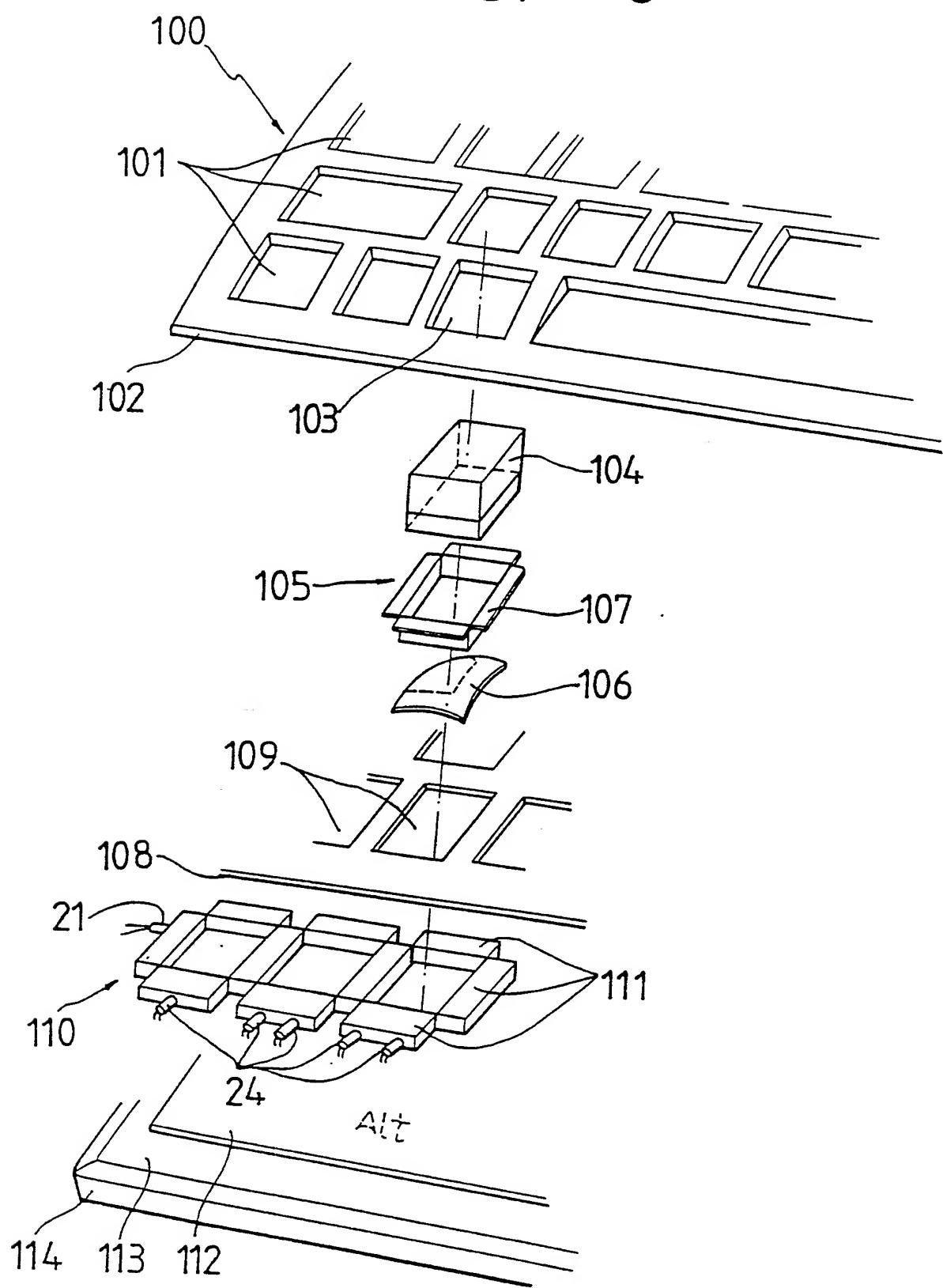


FIG. 3



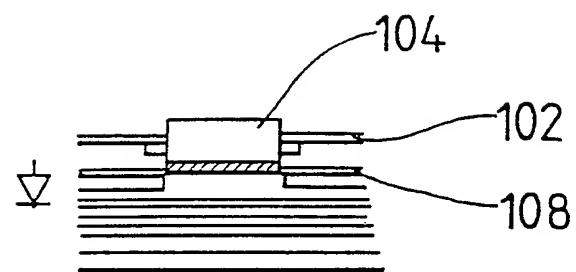
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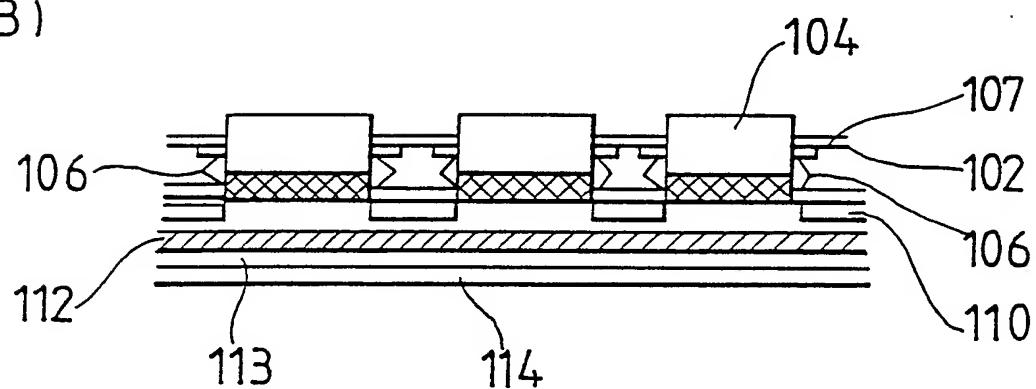
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F I G. 5

6/10  
F I G. 6

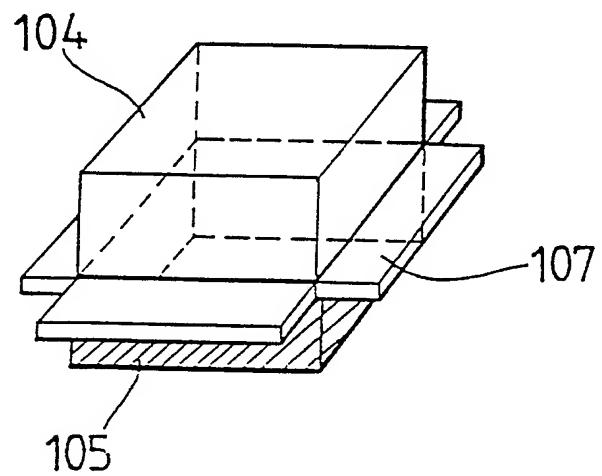
(A)



(B)



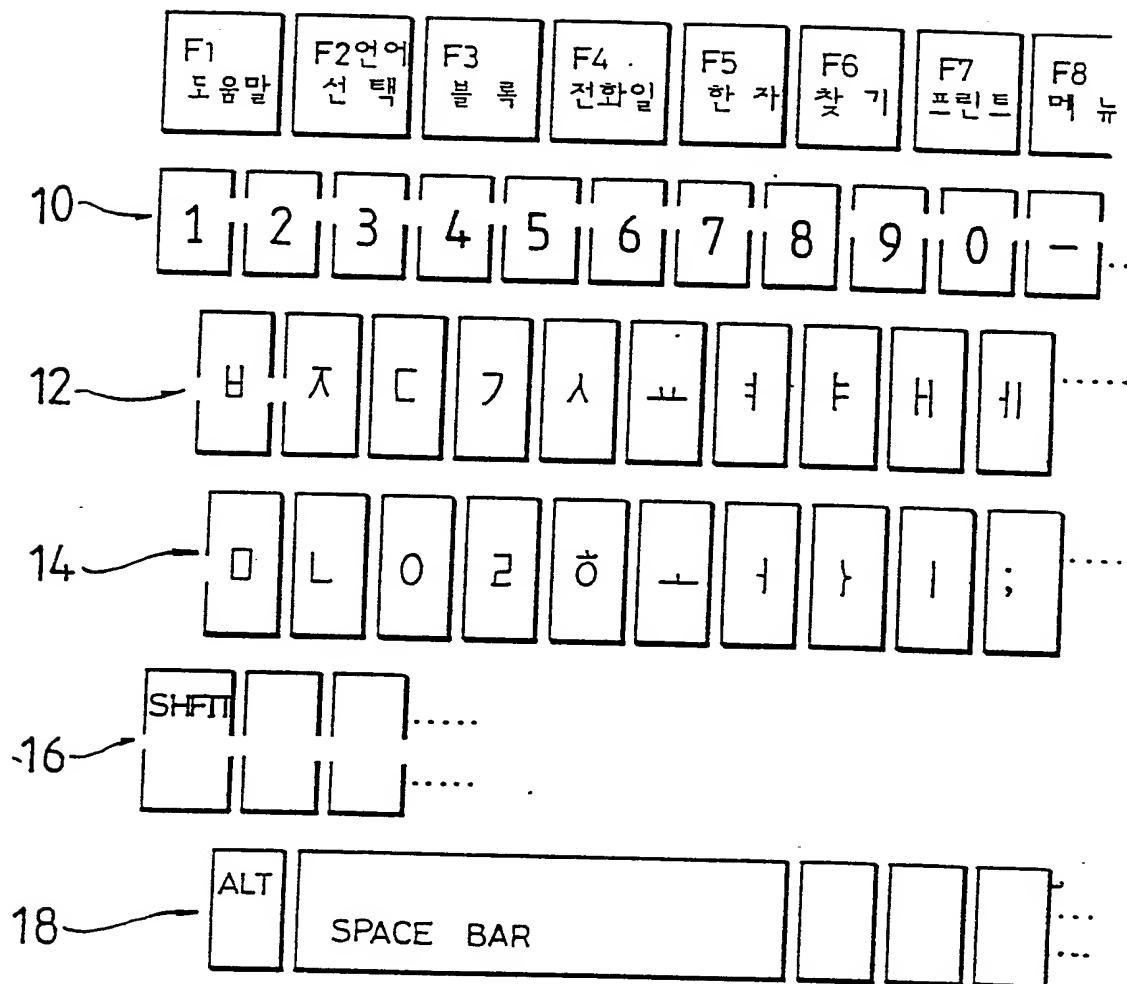
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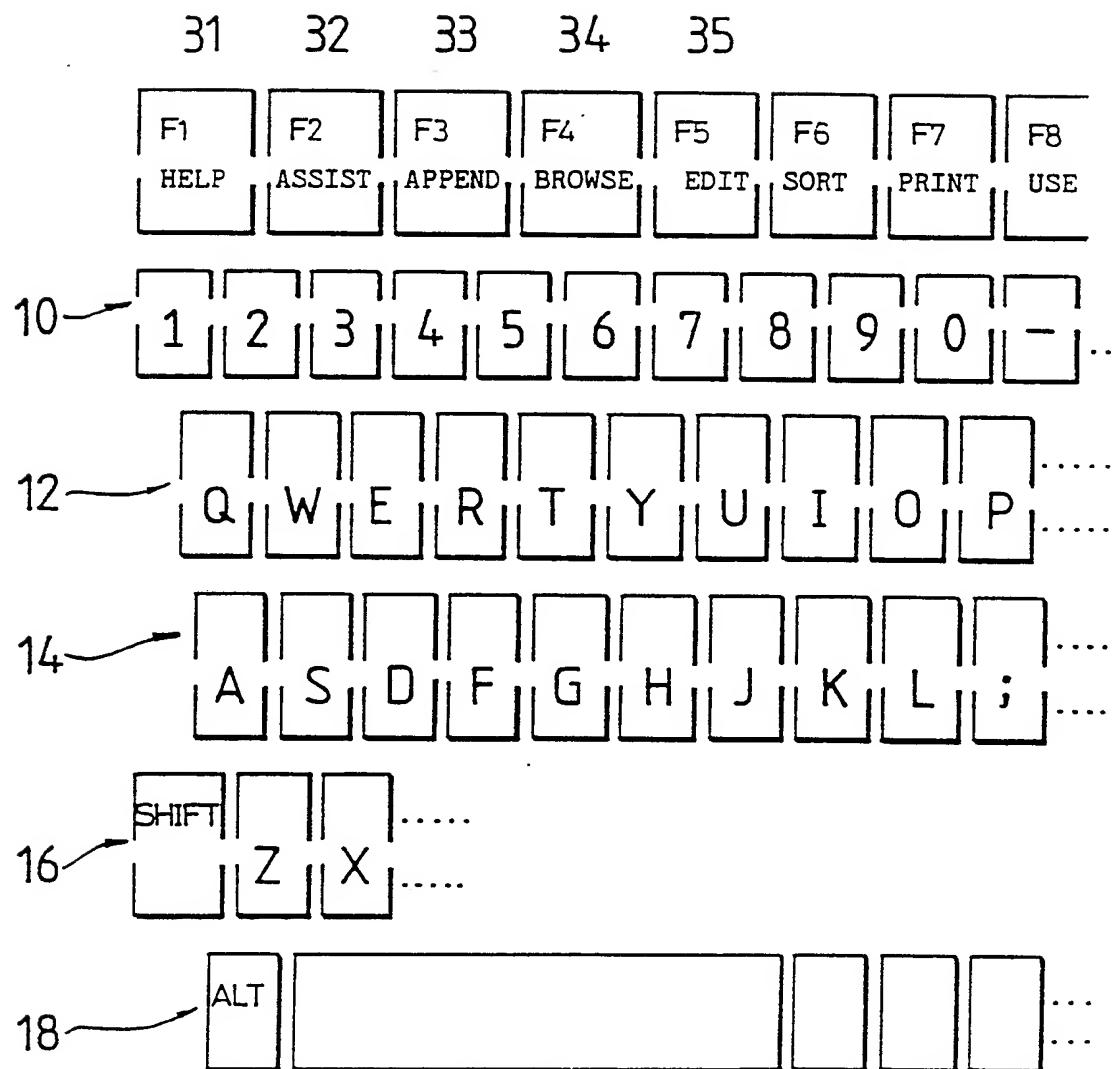
## F I G. 7

31 32 33 34 35 36



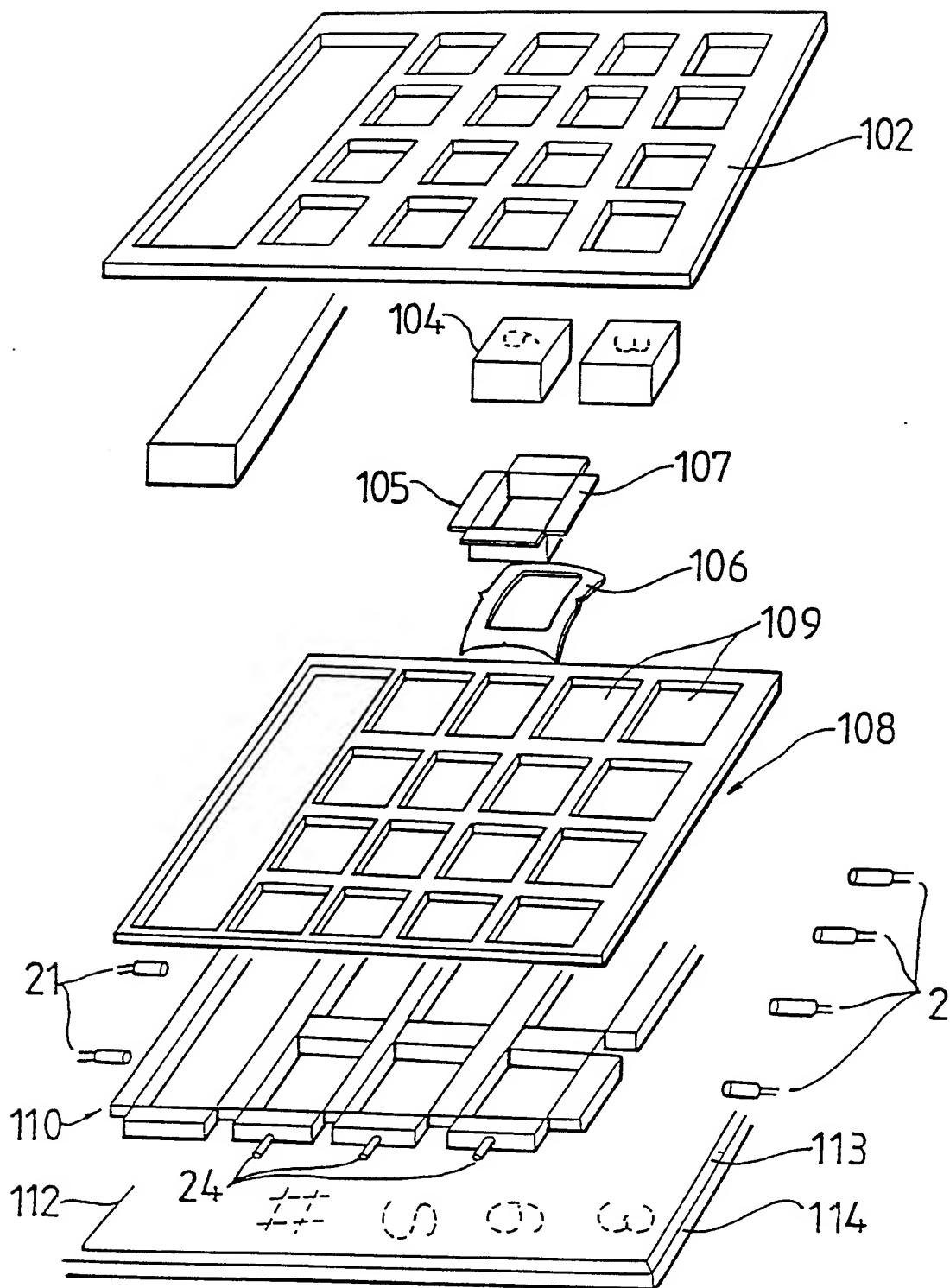
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## F I G. 8



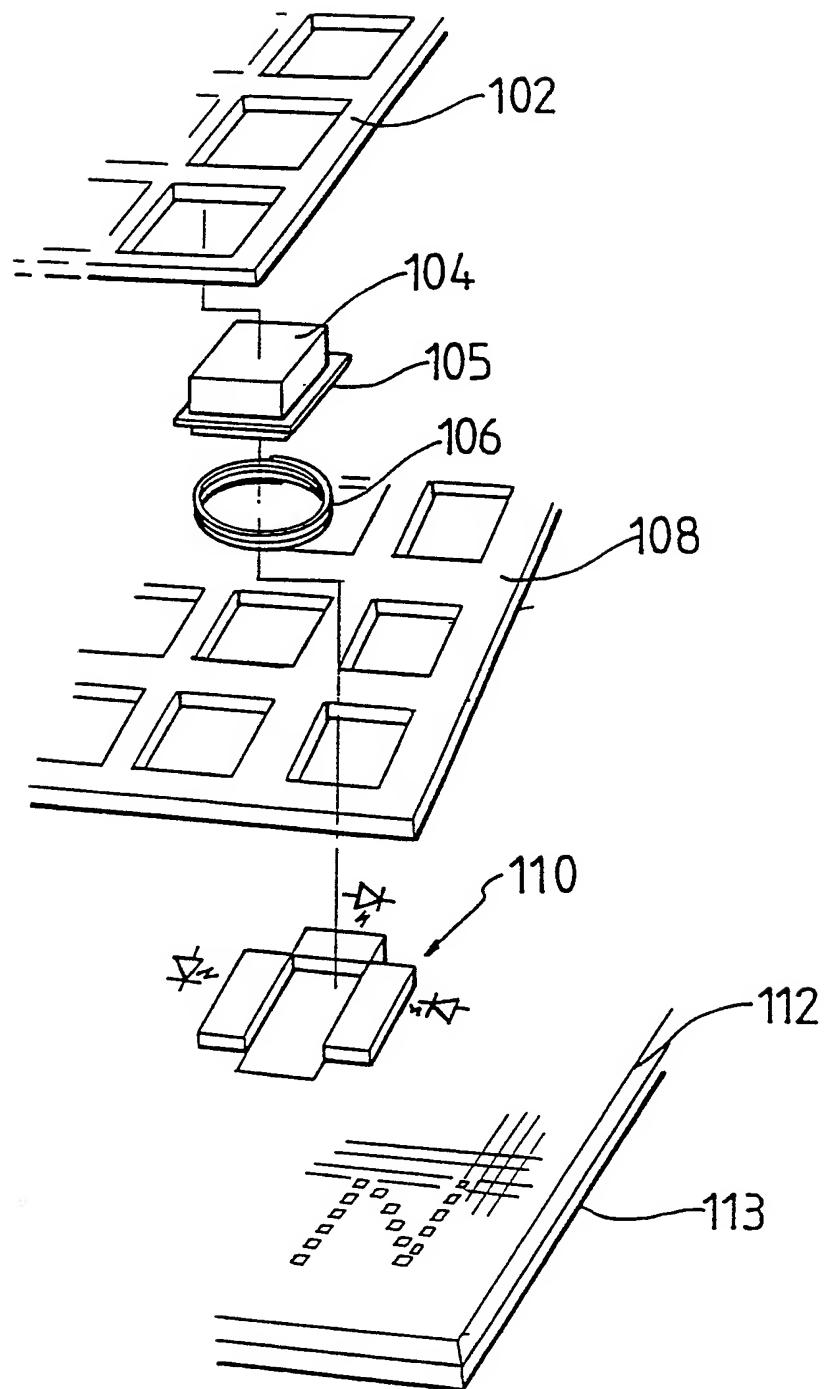
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F I G. 9



10/10

## F I G. 10



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR 92/00021

## A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl.<sup>5</sup>: G 06 F. 3/02; B 41 J 5/08; G 02 B 26/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl.<sup>5</sup>: G 06 F; G 02 B; B 41 J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE, A1, 3 417 997 (SIEMENS) 31 January 1985 (31.01.85), see claims 1-4, Fig. 1,2,3,6.	1,4,5
X	EP, A1, 0 054 644 (BURROUGHS) 30 June 1982 (30.06.82), see claims 1-10, Fig. 1-6.	1,4,5
A	EP, A2, 0 089 239 (BURROUGHS) 21 September 1983 (21.09.83), see claims 1-6, Fig. 1-5.	1
A	EP, A1, 0 269 320 (FURUKAWA) 01 June 1988 (01.06.88), see claims 1-9, Fig. 1-12.	1
A	WO, A1, 83/03 386 (IBM) 13 October 1983 (13.10.83), see abstract, Fig. 1-4.	1,5
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AUSTRIAN PATENT OFFICE  
Kohlmarkt 8-10  
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Information on patent family members

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Im Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
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